formed by rarefaction, and consequent refrigeration, of the metallic gases constituting the stratum in which the cyclone exists. He argues that it is formed within the mass of cooled hydrogen drawn from the chromosphere into the vortex of the cyclone. Speaking of the cyclones, he says:—'Dans leur embouchure évasée ils entraîneront l'hydrogène froid de la chromosphère, produisant partout sur leur trajet vertical un abaissement notable de température et une obscurité relative, due à l'opacité de l'hydrogène froid englouti' (*Revue Scientifique*, March 24, 1883). Considering the intense cold required to reduce hydrogen to the 'critical point,' it is a strong supposition that the motion given to it by fluid friction on entering the vortex of the cyclone, can produce a rotation, rarefaction, and cooling, great enough to produce precipitation in a region so intensely heated."—(*Essays*, 1891 Edition, vol. i., pp. 188-9.)

Churchfield, Edgbaston. F. HOWARD COLLINS.

Direct Determination of the Gravitative Constant by Means of a Tuning-fork. A Lecture-Experiment.

THE following direct experiment for finding the value of the constant g has proved an instructive one for use with students beginning dynamics, and combines extreme simplicity with greater accuracy than might be anticipated.

A rectangular strip of thick plate-glass with one face lightly smoked is dropped past the end of a sounding tuning-fork of known pitch, and which, by means of a light attached style, traces on the smoked surface a fine rippling line whose undulations give a complete record of the relative motion. From measurements of such a trace the value of g can be determined immediately with an error of not more than ½ per cent.

For let l_1 and l_2 be the distances fallen through in two equal consecutive intervals of time (t). Then $\frac{l_1}{t}$ and $\frac{l_2}{t}$ are the velocities at the middles of these two intervals, and $\frac{l_2 - l_1}{t}$ is therefore the velocity gained in time t, and $\frac{l_2 - l_1}{t^2}$ is the acceleration.

With a fork giving 384 complete oscillations per second it was found convenient to take for t the time of 30 oscillations; l_1 is then the length of any 30 consecutive waves and l_2 that of the next 30. These lengths were measured by means of a millimetre scale printed on card and held against the trace, tenths of a millimetre being estimated. The value of the difference $(l_2 - l_1)$ was thus determined from several measures made in different parts of the trace, and, after some preliminary trials, it was found that such measures seldom differed by more than ½ per cent. from their mean, and that the means of different traces agreed about equally well among themselves. Under the given conditions $(l_2 - l_1)$ is just under 6 centimetres. The experiment takes only a moment to perform, and the plate can be at once exhibited as a lantern slide.

In order to obtain good traces a little care must be exercised. The smoking should be very light. A fine bristle from a clothes- or hearth-brush, 2 to 4 cm. long, stuck on with a scrap of wax, may be used as a style, and it should be inclined downwards so as to make an angle of 45° or less with the vertical face of the plate and project well under the plate before this is let fall, so as to be considerably bent while tracing. By furnishing each prong with such a bristle two simultaneous tracings are obtained. Although the method is independent of the actual velocity with which the plate reaches the style, yet it is best to let the plate fall from quite close above the end of the style (within, say, 1 cm.), so that as many wave-lengths as possible may be marked on the plate. The fork also should be strongly bowed with a violin bow, so as to give sharply accentuated ripples, the positions of whose crests are defined with greater precision than would be those of gentler undulations. The plate itself can be conveniently let go if the upper part of its suspension is a single string with a knot at the top, and to prevent its swinging in the air or turning as it descends, it may be held against a narrow smooth backing of hard wood. Without these precautions the trace is liable to show curvature and other irregularities, and indeed under any circumstances the first one or two undulations traced near the advancing edge of the plate are liable to be irregular. The more massive the plate the less is its motion affected by the pressure of the tracing style.

Although as a means of finding the value of g such a method does not compare for accuracy with the use of a pendulum, yet for the converse process of determining the pitch of a fork from measures of its trace and the known value of g, it may be of utility; for, since the length $(l_2 - l_1)$ is proportional to the *square* of the vibration-number, the percentage error will now be halved or reduced to about 1 in 400, and I have little doubt that a careful experimenter, by attending to the causes of error, might further improve on this. A. M. WORTHINGTON.

R.N.E. College, Devonport, September 12.

A Meteor.

ON Wednesday, September 14, at 7h. 9m. p.m. a large meteor was seen by about twenty people, including myself, who were driving from Penmaenmawr to Conway. It was first observed in the south-east just above the Conway mountain. It was visible for about 30°, fell very slowly in a wavy line inclined at a small angle to the horizon, disappearing behind the mountain. It seemed to be very near the ground as it passed over the mountain.

The sky was quite bright, so that only Mars was clearly visible in it. The meteor appeared to the eye about the size and brightness of Jupiter at the present time, and was of a slightly bluer tint than that planet. There was no perceptible variation in size and brilliance while the meteor was in sight.

September 19. GRACE E. CHISHOLM.

Crater-like Depression in Glaciers.

A PROPOS de la cavité du glacier de Tête Rousse que M. Vallot et moi avons découverte et dont vous parlez dans NATURE (September 1), M. R. von Lendenfeld vous écrit (NATURE, September 15) qu'il a trouvé des dépressions cratériformes sur le glacier de Tasman, dans la Nouvelle Zélande. Permettez-moi de vous signaler que de pareilles dépressions existent sur certains glaciers des Alpes et notamment sur le glacier de Gorner, où la carte suisse en indique 26. Elles sont en général à peu près circulaires; leur plus grande dimension horizontale atteint parfois 130 mètres et leur profondeur 30 mètres. L'inclinaison de leurs parois varie en général de 45° à la verticale. Elles reçoivent souvent de l'eau qui s'engouffre au fond dans un moulin ou qui s'écoule, par une crevasse, dans une dépression voisine. Au mois d'août dernier, l'une d'elles formait un véritable petit lac glaciaire que j'ai sondé avec M. Etienne Ritter au moyen d'un bateau démontable; la profondeur de l'eau était presque partout de 5 à 6 mètres, sauf dans un trou, vraisemblablement un moulin, où ma sonde est descendue jusqu'à 21 mètres. Il est probable que, lorsque la pression de l'eau aura élargi le moulin par où elle s'écoule, la cavité se videra.

Les dépressions ne me paraissent avoir aucune analogie avec la cavité que j'ai vue à Tête Rousse. Leur origine est assez mal connue (voir Heim, "Gletscherkunde," p. 246); il est possible, comme le pensait primitivement votre honorable correspondant, qu'elles soient d'anciens moulins transformés.

J'en ai vu une également sur la Mer de Glace, entre le Montanvers et le Tacul.

L'étude de ces dépressions, encore très incomplète, serait très intéressante, et je les signale à l'attention de ceux qui parcourent les glaciers.

Veuillez agréer, monsieur, mes civilités empressées.

Thonon, le 17 Septembre. ANDRÉ DELEBECQUE.

GENERALIZATION OF "MERCATOR'S" PROJECTION PERFORMED BY AID OF ELECTRICAL INSTRUMENTS.

THE following mode of generalizing Mercator's Projection is merely an illustration of a communication to Section A of the British Association at its recent meeting in Edinburgh, entitled "Reduction of every Problem of Two Freedoms in Conservative Dynamics to the Drawing of Geodetic Lines on a Surface of given Specific Curvature." An abstract of this paper appeared in NATURE for August 18.

In 1568, Gerhard Krämer, commonly known as "Mercator" (the Latin of his surname), gave to the world